Check List the journal of biodiversity data

LISTS OF SPECIES

Check List 12(5): 1977, 9 October 2016 doi: http://dx.doi.org/10.15560/12.5.1977
ISSN 1809-127X © 2016 Check List and Authors

Anurans of the municipality of Barão de Monte Alto, state of Minas Gerais, southeastern Brazil

Elvis A. Pereira[1*], **Matheus O. Neves**[1], **Priscila S. Hote**[1], **Diego J. Santana**[2] and **Renato N. Feio**[1]

1 Museu de Zoologia João Moojen, Departamento de Biologia Animal, Universidade Federal de Viçosa, Viçosa, MG, Brazil
2 Departamento de Biologia Animal, Universidade Federal de Mato Grosso do Sul, Campo Grande, MS, Brazil
* Corresponding author. E-mail: elvisaps@hotmail.com

Abstract: We present a list of the anuran amphibians from municipality of Barão de Monte Alto, state of Minas Gerais, southeastern Brazil. This region is part of the remaining Atlantic Forest and the studied environments are represented by forest patches and open habitats. We recorded 29 anuran species, many of these typical and/or endemic to the Atlantic Forest. None of the species registered was considered under threat of extinction in state, national or international red-lists. It is worth noting, however, the presence of the tree frogs *Dendropsophus pseudomeridianus*, the first record of this species in the state of Minas Gerais, and *D. bipunctatus,* marking its expanded distribution in various locations of Minas Gerais. The present list examines zoogeography and conservation of anurans in the Brazilian southeast and broadens the knowledge of the anuran fauna in this region.

Key words: amphibians; anuran fauna; Atlantic Forest; inventory; new records

INTRODUCTION

Global biodiversity has changed rapidly as a complex response to various environmental alterations caused by human activities (Vitouseck et al. 1997). Intact ecosystems have continuously been degraded, and the greatest threat to biodiversity is habitat loss (Balmford et al. 2002; Metzger et al. 2008). Accordingly, loss and degradation of suitable habitats are some of the factors most responsible for the global decline of amphibian populations (Brooks et al. 2002; Gardner et al. 2007).

The Atlantic Forest located in eastern South America is considered one of the richest and most threatened ecoregions of the planet, making it a priority area for the development of effective biodiversity conservation policies (Myers et al. 2000; Mittermeier et al. 2004).

The lowland semideciduous forest within the Atlantic Forest is considered one of the most threatened forest formations and has been diminished by agricultural expansion, urbanization, structural expansion and hydroelectric power plants since the early 20th century, with its remaining vegetation covering less than 8% of the original area (SOS Mata Atlântica e Instituto Nacional de Pesquisas Espaciais 1997). The Zona da Mata region in southeastern Minas Gerais state was reduced to about 6% of native forest by the 1980s (Fonseca 1985). Due to this high degree of devastation, many typical forest species are restricted to the few protected areas or remaining fragments (Bertoluci 1998) and much of the local biodiversity may already no longer exist in the region (Ribon et al. 2003).

Knowledge of local anuran fauna is essential for the establishment of management plans and conservation efforts towards existing species, as well as for a better understanding of biogeography and ecology (Eterovick et al. 2005; Lips et al. 2005). In the tropics, there are several gaps in the knowledge of geographical distribution of species, with many areas of considerable size where no records were generated (Lawler et al. 2006; Cole et al. 2014). For many amphibians in Brazil there is little information about geographic distribution, natural history, life history and ecology, making it difficult to understand current trends and possible population declines (Silvano and Segalla 2005).

Studies of amphibians in the state of Minas Gerais are regionalised and usually performed near major research centres (Nascimento et al. 2009). Although there is still no specific effort to build inventory, there are records of approximately 200 species of amphibians in Minas Gerais (Drummond et al. 2009). The greatest diversity of amphibians in the state is concentrated in the Atlantic Forest, where about 150 species of the 458 known from the biome (Haddad et al. 2013) occur in the remaining lowland forest areas on the banks of large rivers, upland forests, and highland regions (Nascimento et al. 2009).

The mountainous regions of southeastern Brazil are identified as priority areas for conservation (Cruz and

Feio 2007). In general, studies of amphibians undertaken in the Atlantic Forest of Minas Gerais include the highland ranges of Mantiqueira and Espinhaço in areas located 1000 m above sea level (Nascimento et al. 2005, 2009), where the rate of endemism for amphibians is high (Cruz and Feio 2007). Most protected areas (UCs) in Minas Gerais are in high elevation areas, resulting in some negligence in the protection of the few forest fragments of lowland areas; these areas may harbour a great diversity that is not being protected. Several studies on amphibians in lowland areas have already been made, documenting important records and even describing new species (e.g., Feio and Caramaschi 1995, 2002; Feio et al. 1998, 1999; Feio and Ferreira 2005; Santana et al. 2010; Caramaschi et al. 2012; Assis et al. 2013) implying great biological value in these areas.

This study aimed to inventory the anuran species in the municipality of Barão de Monte Alto, and discuss aspects of geographic distribution, taxonomy and conservation status of the species.

MATERIALS AND METHODS

Study site

We conducted this study in the municipality of Barão de Monte Alto (21°14′42″ S, 042°14′16″ W, WGS84), Zona da Mata region, southeast part of the state of Minas Gerais (MG), Brazil (Figure 1). The 198.313 km^2 area (IBGE 2016) is located in the valley of the Paraíba do Sul River, with elevations ranging from 132 to 700 m between the Serra da Mantiqueira and Serra do Mar mountain ranges, within the Atlantic Forest, located in Zona da Mata of Minas Gerais. Despite a high environmental degradation in the region caused by agricultural activities, there remain fragments of native vegetation in good condition, with the potential to harbour a wide range of vertebrates species. Those fragments are not protected areas, and the majority are privately owned. However, no data are available about the fauna of this region. The climate is megathermal, with Aw climate "Tropical with dry winter" (Alvares et al. 2014), with an average annual rainfall of 1,287 mm and

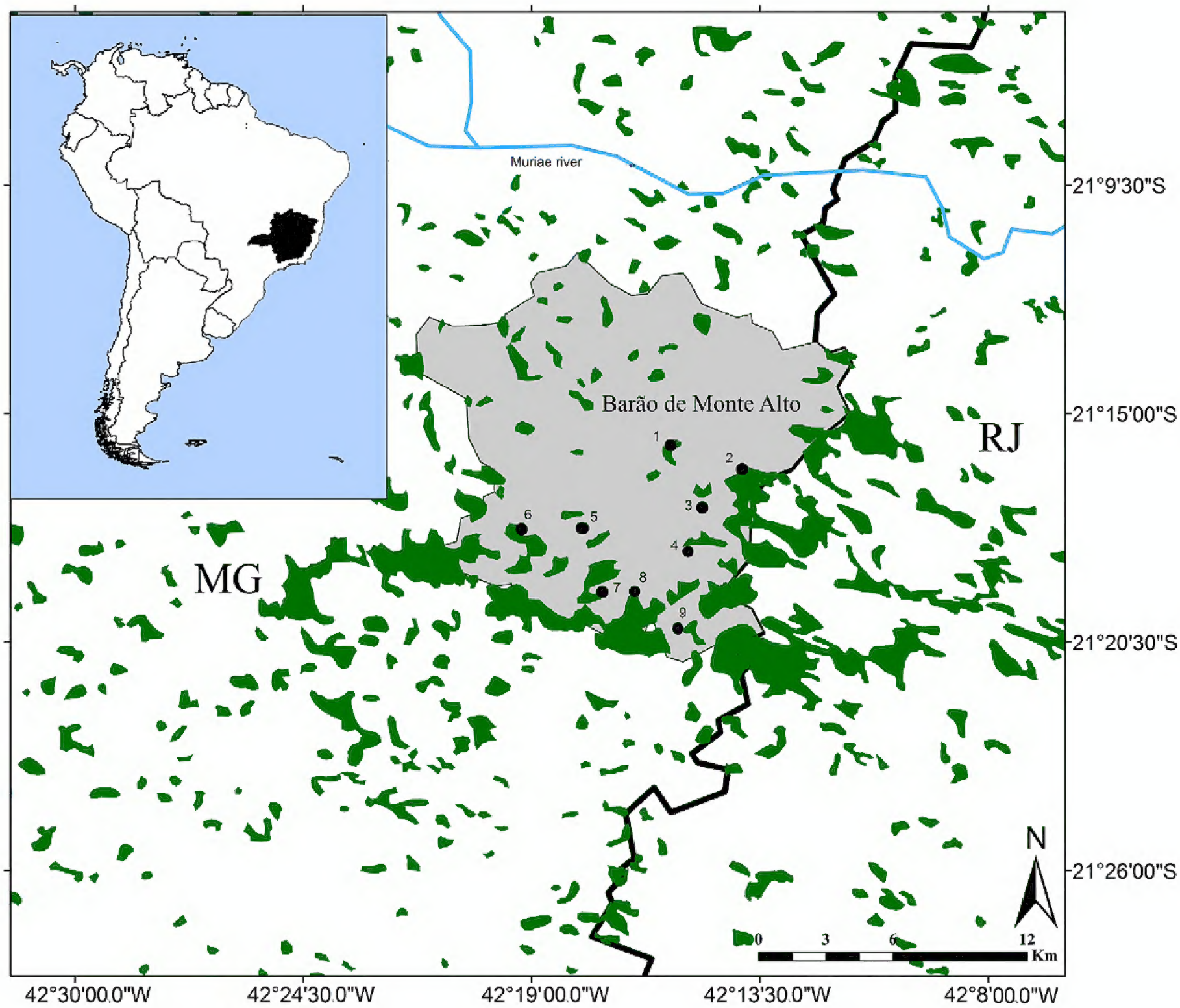

Figure 1. municipality of Barão de Monte Alto (gray), State of Minas Gerais (black), Brazil with the locations of the main sample points (black circles). Blue lines: watersheds; green polygons: Atlantic Forest fragments (SOS Mata Atlântica and Instituto Nacional de Pesquisas Espaciais). (1) Paulo Pond, (2) Temporary Stream and Marsh – TSM; (3) Three ponds; (4) Waterfall; (5) Dam Zé 1; (6) Dam Zé 2; (7) Marsh and Permanent Pond – MPP; (8) Temporary Marsh and Pond – TMP; (9) Odilon Pond.

Table 1. Sampling points in the municipality of Barão de Monte Alto, State of Minas Gerais, Brazil.

Points	Coordinates	Environments	Description Environments
1	21°15'55.50" S, 042°15'32.90" W	Pond Paulo	Pond in pasture area
2	21°16'29.30" S, 042°14'05.40" W	Temporary Stream and Marsh (TSM)	Stream and marsh in forest area preserved
3	21°17'17.00" S, 042°14'38.90" W	Three ponds	Pond in pasture area
4	21°18'06.30" S, 042°15'09.20" W	Waterfall	Waterfall with riparian forest preserved
5	21°17'43.20" S, 042°17'46.90" W	Dam Zé 1	Dam with riparian forest preserved
6	21°17'45.80" S, 042°19'02.70" W	Dam Zé 2	Dam in pasture area
7	21°19'28.60" S, 042°17'13.20" W	Marsh and Permanent Pond (MPP)	Marsh and pond in secondary forest area
8	21°19'20.70" S, 042°16'23.10" W	Temporary Marsh and Pond (TMP)	Marsh and pond in secondary forest area
9	21°20'08.10" S, 042°15'27.60" W	Pond Odilon	Pond in pasture area

average annual temperature of 22.6°C (Köppen 1948). On the outskirts of the city of Barão de Monte Alto, the Muriaé River is one of the largest and most important tributaries of the Paraíba do Sul River, which makes the region an important recharge area for this basin.

The species listed here occur in different types of habitats, such as streams, swamps, ponds, secondary forest, fields and temporary aquatic environments, all of these sites located in privately owned areas (Figure 2A–D). We tried to sample the widest range of environments in areas with different vegetation types (Table 1).

Data collection

We conducted monthly surveys of data collection, for four consecutive days each during the rainy season of 2013–2014 (October to March) and three days each during the rainy season of 2014–2015 (October to March), totalling 42 days. The collectors worked in pairs, for a total of about 180 hours of field time, a sampling effort of 90 h/person. For the purposes of standardisation of sampling effort and to avoid the possible variation of daily variation in water parameters, the order of the sampled environments was chosen randomly at the start of sampling in each survey. Inventory methods followed the 'complete species inventories', 'visual encounter surveys' and 'audio strip transects' found in Heyer et al. (1994). Vocalisations were registered using a digital recorder (Olympus DM 420) with built-in microphone.

Voucher specimens were collected under permits from the Instituto Chico Mendes de Conservação da

Figure 2. Some sampled environments in the municipality of Barão de Monte Alto, State of Minas Gerais, Brazil. **A:** Pond in open area, **B:** Stream in open area; **C:** Temporary marsh and **D:** Stream in forest area.

Biodiversidade (ICMBio No. 40744–1 and 40744–2). Specimens were photographed, euthanised in 5% xylocaine solution, fixed in 10% formalin, preserved in 70% alcohol and deposited in the herpetological collection of the Museu de Zoologia João Moojen at Universidade Federal de Viçosa (MZUFV) (Appendix 1). Species identification was based on morphological and acoustic characters reported in the literature, and comparison with material in the collection of MZUFV. We analysed the calls with Raven Pro 1.5 for Windows (Bioacoustics Research Program 2014) using the following parameters: call duration, notes/call, range of frequency (kHz) and dominant frequency (kHz). Terminology of spectral parameters of the calls followed Gerhardt et al. (2007).

The Red List of Threatened Species of the International Union for Conservation of Nature (IUCN 2015) was consulted to obtain the conservation status of each species. The Red List of animal species threatened with extinction in the state of Minas Gerais (Drummond et al. 2009) and the Red list of Brazilian fauna threatened with extinction (MMA 2014) were also consulted. Taxonomy followed the most recent list of Brazilian Amphibians (Segalla et al. 2014).

Data analysis

Regarding distributions of D*endropsophus pseudomeridianus* (Cruz, Caramaschi & Dias 2000) and *D. bipunctatus* (Spix 1824), we reviewed the known distribution and new records in Minas Gerais through literature surveys, field trips, visits to museum collections (MZUFV, MNRJ, LZV and MCNAN) and searches for information in computerised collections, e.g., SpeciesLink (2015) (Figures 3 and 4).

To determine the efficiency of the sampling effort, we performed an accumulation curve with 1,000 randomisations generated from the data matrix (presence-absence) for every night of observation. We used the species richness estimator Bootstrap to determine the expected richness of amphibians (Colwell and Coddington 1994; Colwell 2013), with a confidence interval (CI) of 95%. This analysis was performed using EstimateS v.9.0.0 (Gotelli and Colwell 2001).

RESULTS

We found 29 anuran species, in 14 genera and nine families: Bufonidae (1; Figure 5A), Brachycephalidae (1), Craugastoridae (1; Figure 5B), Cycloramphidae (1; Figure 5C), Hylidae (16; Figures 5D–H; Figures 6A–H and Figure 7A), Microhylidae (1), Leptodactylidae (6; Figure 7B–D), Odontophrynidae (1; Figure 7E) and Ranidae (1; Figure 7F) (Table 2). The Hylidae accounted for 53% of the total species richness found.

We also report new localities for the distribution of *Dendropsophus bipunctatus* in Minas Gerais and the first record of *D. pseudomeridianus* for Minas Gerais. The record of *D. bipunctatus* from the municipality of Marliéria represents the most inland record of this species, 680 km southwest of the type locality in the municipality of Ilhéus in the state of Bahia (Figure 4). Our record of *D. pseudomeridianus* for Minas Gerais extends

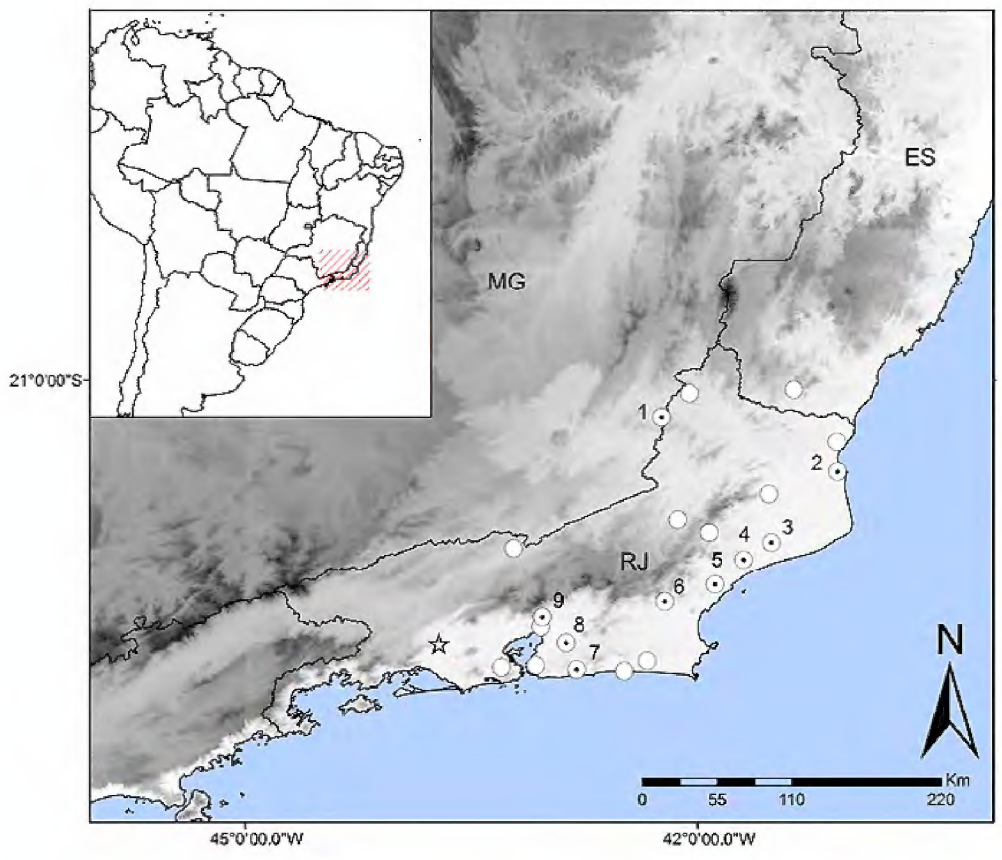

Figure 3. Map showing the known distribution of *Dendropsophus pseudomeridianus* (Cruz, Caramaschi & Dias 2000) in southeastern Brazil. The gray color gradients represent elevation. State abbreviations: ES, Espírito Santo; MG, Minas Gerais; RJ, Rio de Janeiro. Type locality: Seropédica (star); literature records (circle); new records (white circle with black dot). 1 – Barão de Monte Alto–MG, 2 – São João da Barra–RJ, 3 – Quissamã–RJ; 4 – Carapebus–RJ; 5 – Macaé–RJ; 6 – Casimiro de Abreu–RJ; 7 – Maricá–RJ; 8 – Itaboraí–RJ; 9 – Guapimirim–RJ.

Figure 4. Map showing the known distribution of *Dendropsophus bipunctatus* (Spix 1824) in eastern Brazil. The gray color gradients represent elevation. State abbreviations: BA, Bahia; ES, Espírito Santo; MG, Minas Gerais; RJ, Rio de Janeiro; SP, State of São Paulo. Type locality: Ilhéus (star); literature records (circle); new records for the State of Minas Gerais (white circle with black dot). 1 – Salto da Divisa, 2 – Marliéria, 3 – Orizânia, 4 – Barão de Monte Alto, 5 – Cataguases, 6 – Itamarati–de–Minas, 7 – Goianá, 8 – Pirapetinga, 9 – Volta Grande, 10 – Além Paraíba, 11 – Chiador.

the distribution approximately 230 km northeast from the type locality (Figure 3). The specimens were collected in a pond in pasture (21°27′59″ S, 042°23′50″ W, 560 m) at Point 1.

DISCUSSION

The anuran fauna in Barão de Monte Alto represents 6.5% of the estimated total of 459 species of the Atlantic Forest biome (Haddad et al. 2013) and 15% of the estimated total of 200 species recorded in Minas Gerais (Nascimento et al. 2009). Among the recorded species, 18 are endemic to the Atlantic Forest (Haddad et al. 2013) and among all sampling sites, *Dendropsophus branneri* (Cochran 1948), *D. minutus* (Peters 1872) and *Hypsiboas albopunctatus* (Spix 1824) were the most frequently encountered, and *Adenomera marmorata* (Steindachner 1867) and *Ischnocnema* sp. were the least, with a single record each.

Among the species encountered, we noted a high number of generalist and widely distributed species, such as *Dendropsophus minutus, D. elegans* (Wied-Neuwied 1824), *Elachistocleis cesarii* (Miranda Ribeiro 1920), *Hypsiboas albopunctatus, Leptodactylus fuscus* (Schneider 1799), *L. latrans* (Steffen 1815), *Physalaemus cuvieri* Fitzinger 1826 and *Scinax fuscovarius* (A. Lutz 1925) (Feio et al. 1998; Feio and Ferreira 2005; Frost 2016). Most of these species occur mainly in open areas (Feio and Ferreira 2005). Although some species exhibit close relationship with rainforest habitat, such as *Dendropsophus branneri* and *Hypsiboas faber* (Wied-Neuwied 1821), they are also considered generalists, and can be found in anthropogenic areas (Feio and Ferreira 2005). *Rhinella ornate* (Spix 1824), *Dendropsophus branneri*, *D. elegans*, and *Scinax fuscovarius* were found in areas of high anthropogenic impact, such as urban areas close to residences. Nevertheless, species dependent on forested areas, such as *Ischnocnema* sp. and *Procerathophrys boiei* (Wied-Neuwied 1825), were encountered only within forest fragments. We recorded two species typical of lowland habitats: *Dendropsophus branneri* and *Hypsiboas albomarginatus* (Spix 1824) (Feio et al. 1998, Santana et al. 2010). These species range from northern Rio de Janeiro state, through the Rio Paraíba valley to the region of the High Muriaé River (Santana et al. 2010).

Compared to other areas of the Atlantic Forest in Minas Gerais (Table 3), the richness of amphibians in the study area can be considered high, taking into account the size of the area, the sampling period and the great environmental degradation affecting the region. The Hylidae had the highest species diversity, similar to other locations near the study area (e.g., Santana et al. 2010; Moura et al. 2012). The predominance of ecological generalist species in the study area suggests an great amount of degradation around the forest remnants we surveyed.

The accumulation curve does not show a tendency to asymptote, and the estimated richness for the

Table 2. List of anurans species recorded for the municipality of Barão de Monte Alto, State of Minas Gerais between 2013–2015, with information on their distribution in sampling points.

Taxon	Sampling points
Bufonidae	
Rhinella ornata (Spix 1824)	2, 3, 5, 7 and 8
Brachycephalidae	
Ischnocnema sp. (*I. guentheri* series)	8
Craugastoridae	
Haddadus binotatus (Spix, 1824)	2, 5 and 8
Cycloramphidae	
Thoropa miliaris (Spix, 1824)	2, 3, 4, 6, 7 and 8
Hylidae	
Dendropsophus bipunctatus (Spix, 1824)	1 and 7
Dendropsophus branneri (Cochran, 1948)	1, 2, 3, 4, 5, 6, 7, 8 and 9
Dendropsophus decipiens (Lutz, 1925)	7
Dendropsophus elegans (Wied-Neuwied, 1824)	1, 2, 3, 5, 6, 7, 8 and 9
Dendropsophus minutus (Peters, 1872)	1, 2, 3, 4, 5, 6, 7, 8 and 9
Dendropsophus pseudomeridianus (Cruz, Caramaschi & Dias, 2000)	2
Hypsiboas albomarginatus (Spix 1824)	1, 3, 4, 6, 7 and 8
Hypsiboas albopunctatus (Spix, 1824)	1, 2, 3, 4, 6, 7, 8 and 9
Hypsiboas faber (Wied Neuwied, 1821)	1, 2, 3, 5, 6, 7, 8 and 9
Hypsiboas pardalis (Spix, 1824)	2, 4, 5, 7, 8 and 9
Hypsiboas polytaenius (Cope, 1870 [1869])	2, 4, 7 and 8
Hypsiboas semilineatus (Spix, 1824)	1, 2, 3, 6, 7, 8 and 9
Phyllomedusa rohdei (Mertens, 1926)	1, 2, 3, 5, 7 and 9
Scinax crospedospilus (Lutz, 1925)	7 and 8
Scinax eurydice (Bokermann, 1968)	9
Scinax fuscovarius (Lutz, 1925)	2 and 7
Microhylidae	
Elachistocleis cesarii (Schneider, 1799)	2
Leptodactylidae	
Adenormera marmorata (Steindachner, 1867)	2
Leptodactylus fuscus (Schneider, 1799)	1, 3, 7, 8 and 9
Leptodactylus labyrinthicus (Spix, 1824)	8
Leptodactylus latrans (Steffen, 1815)	1, 2, 3, 5, 6, 7, 8 and 9
Leptodactylus spixi (Heyer, 1983)	3 and 8
Physalaemus cuvieri (Fitzinger, 1826)	2, 3, 4, 7 and 8
Odontophrynidae	
Proceratophrys boiei (Wied-Neuwied, 1825)	2
Ranidae	
Lithobates catesbeianus (Shaw, 1802)	2

Table 3. Number of anurans species recorded in some areas of Atlantic Forest in the State of Minas Gerais. * Protected areas.

Locality	No. of species	Time	Reference
Barão de Monte Alto	29	2 years	Present work
Serra Negra	47	2 years	M.O. Neves (unpubl. data)
Ibitipoca	41	~20 years	Cruz et al. 2009
Juiz de Fora	45	Unknown	Neves et al. (unpubl. data)
Cataguases	55	7 years	C.L. Assis (unpubl. data)
APA Pedra Dourada*	46	2 years	C.P. Neves (unpubl. data)
Serra do Brigadeiro*	58	10 years	Moura et al. 2012
High Muriaé River region	41	3 years	Santana et al. 2010
Rio Novo	20	2 months	Feio and Ferreira 2005
Northeastern Minas Gerais	30	2 years	Feio and Caramaschi 2002
Parque Estadual do Rio Doce*	38	> 5 years	Feio et al. 1998

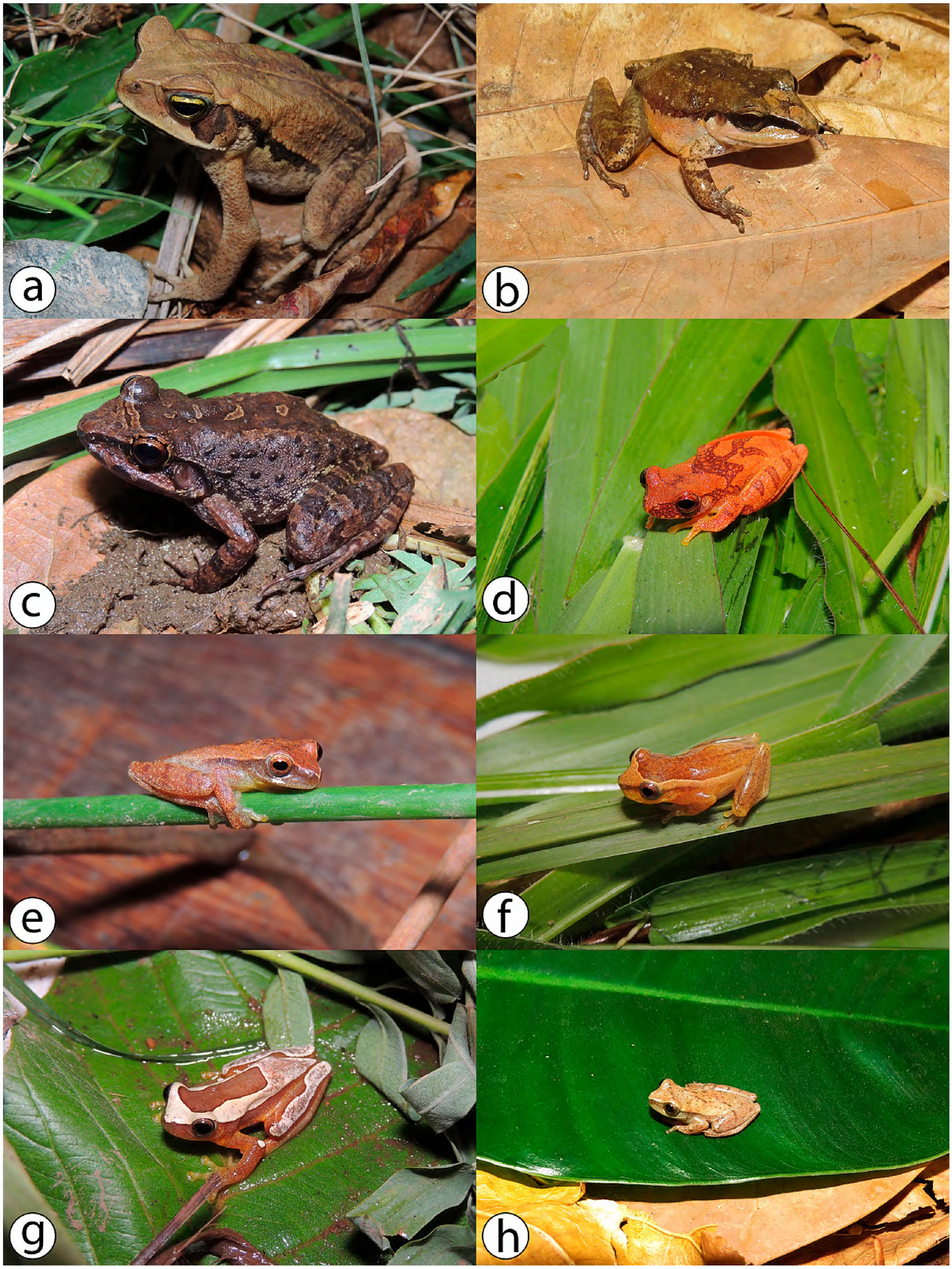

Figure 5. Anuran species found in the municipality of Barão de Monte Alto, State of Minas Gerais, Brazil. **A:** *Rhinella ornata* (Spix 1824), **B:** *Haddadus binotatus* (Spix 1824), **C:** *Thoropa miliaris* (Spix 1824), **D:** *Dendropsophus bipunctatus* (Spix 1824), **E:** *Dendropsophus branneri* (Cochran 1948), **F:** *Dendropsophus decipiens* (A. Lutz 1925), **G:** *Dendropsophus elegans* (Wied-Neuwied 1824) and **H:** *Dendropsophus pseudomeridianus* (Cruz, Caramaschi & Dias 2000).

Figure 6. Anuran species found in the municipality of Barão de Monte Alto, State of Minas Gerais, Brazil. **A:** *Hypsiboas albomarginatus* (Spix 1824), **B:** *Hypsiboas albopunctatus* (Spix 1824), **C:** *Hypsiboas faber* (Wied-Neuwied 1821), **D:** *Hypsiboas polytaenius* (Cope 1870[1869]), **E:** *Hypsiboas semilineatus* (Spix 1824), **F:** *Phyllomedusa rohdei* Mertens 1926, **G:** *Scinax crospedospilus* (A. Lutz 1925) and **H:** *Scinax eurydice* (Bokermann 1968).

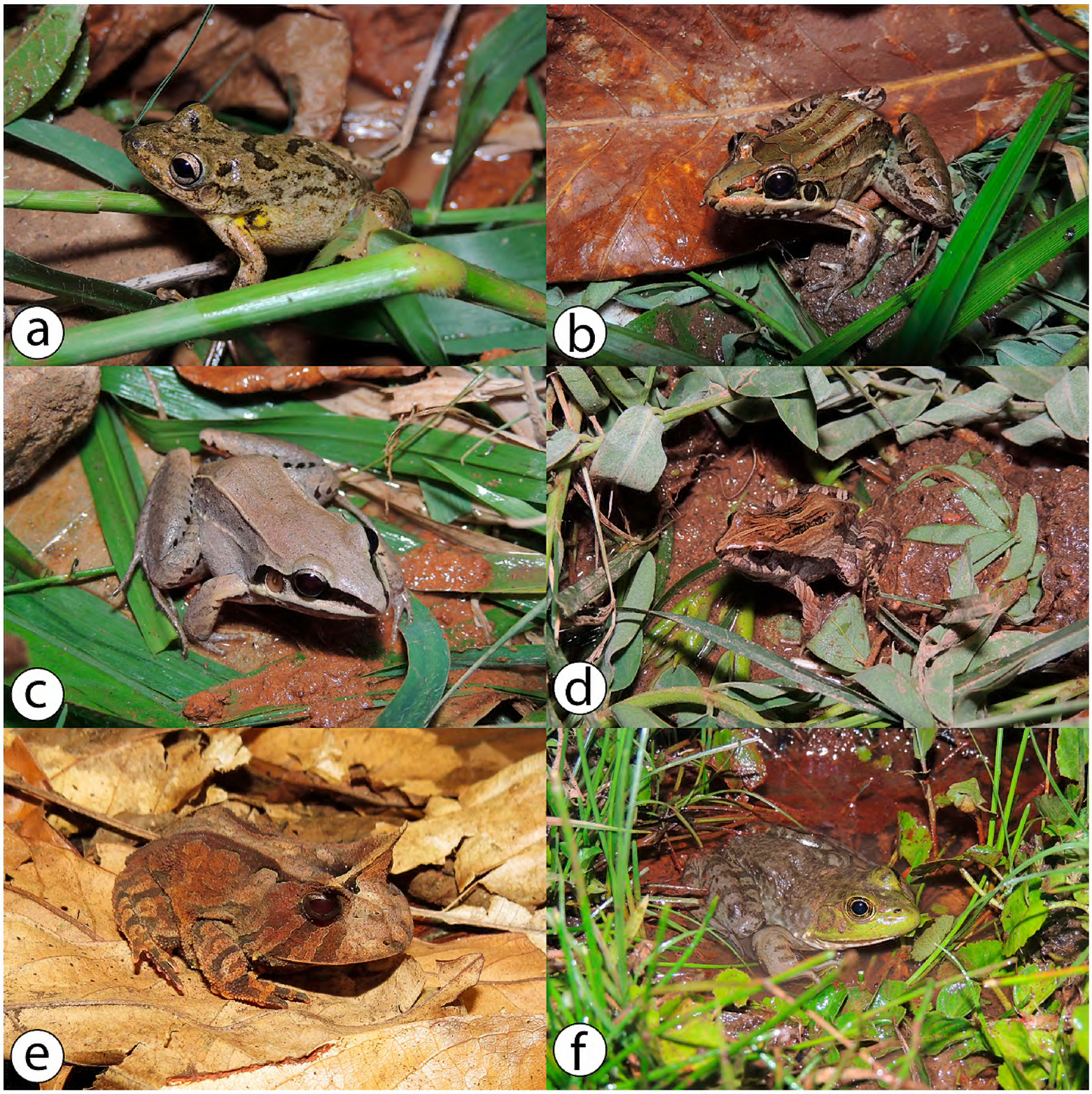

Figure 7. Anuran species found in the municipality of Barão de Monte Alto, State of Minas Gerais, Brazil. **A:** *Scinax fuscovarius* (A. Lutz 1925), **B:** *Leptodactylus latrans* (Steffen 1815), **C:** *Leptodactylus spixi* Heyer 1983, **D:** *Physalaemus cuvieri* Fitzinger 1826, **E:** *Proceratophrys boiei* (Wied-Neuwied 1824) and **F:** *Lithobates catesbeianus* (Shaw 1802).

municipality was 31 species (Figure 8). The Bootstrap index uses data of all species collected to estimate the total richness, not only limited to rare species. Despite the estimated richness suggesting two more species for the region, the sampling seems adequate. Nevertheless, it is important to highlight that accumulation curves rarely stabilize, especially in tropical environments (Santos 2004). We expect that more species may be found with additional surveys in the area. We did not sample diurnally, nor during winter/dry season; additional species may be discovered during these periods.

None of the recorded anuran species are included in the Red List of endangered species of the IUCN (2015), Brazil (MMA 2014) or the state of Minas Gerais (Feio et al. 2008; Drummond et al. 2009). *Leptodactylus labyrinthicus* (Spix 1824) is presumably considered endangered in the state of Rio de Janeiro. According to Caramaschi et al. (2000) this species was abundant in the past but has become very rare in places where they were previously found. In this study abundance was low; only one individual was found.

The taxon *Ischnocnema* sp. (of the *I. guentheri* group)

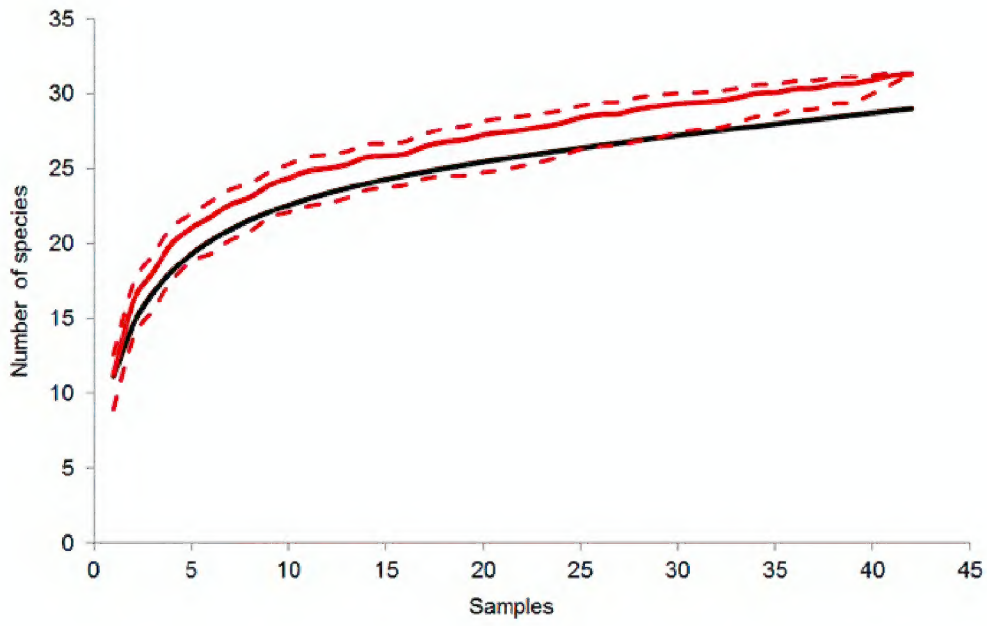

Figure 8. Accumulation curve for anurans sampled at the municipality of Barão de Monte Alto, state of Minas Gerais, southeastern Brazil. Black line represents the accumulation curves, red line represents species estimates based on Bootstrap and red dashed lines represents its interval of confidence.

could not be identified to species level. The *I. guentheri* species complex has high morphological similarity but has not yet been described at species level, diagnosable through advertisement calls and molecular data (Gehara et al. 2013). Other species in this study are species complexes that are under investigation, such as *Adenomera marmorata* (Fouquet et al. 2014), *Dendropsophus minutus* (Gehara et al. 2014), *Phyllomedusa rohdei* (Faivovich et al. 2010) and the study area lies within the hybridization zone between *Rhinella crucifer* (Wied-Neuwied 1821) and *Rhinella ornata* (Thomé et al. 2012).

Only one specimen of the American bullfrog *Lithobates catesbeianus* (Shaw 1802) was recorded, in a disturbed area near an abandoned frog farm. This species has great potential to become invasive in environments into which it is introduced (Kats and Ferrer 2003; Kiesecker 2003; Ficetola et al. 2007). Due to its high environmental plasticity and fertility, and especially its feeding habits, *L. catesbeianus* is considered one of the 100 worst invasive species in the world (Lowe et al. 2000). Frogs with strongly aquatic habits seem to suffer the effects of invasive bullfrogs more intensely (Werner et al. 1995; Pearl et al. 2004).

New records

Some of the species found in the municipality of Barão de Monte Alto represent relevant distribution records. The occurrence of *Dendropsophus pseudomeridianus* is the first record for Minas Gerais (Figure 3). The distribution of *D. pseudomeridianus* was previously defined as the lowland regions of the state of Rio de Janeiro (Cruz and Caramaschi 2000). In 2008 the species was recorded in the southern state of Espírito Santo (Silva et al. 2008). Recently Silveira et al. (2011) recorded it other locations in Rio de Janeiro.

Species typical of coastal areas favor the low elevations of river valleys and disperse to inland areas of the continent, as observed in inland portions of the Doce (Feio et al. 1998, 1999), Jequitinhonha (Feio and Caramaschi 1995, 2002) and Paraíba do Sul river basins (Feio and Ferreira 2005; Santana et al. 2010). *Dendropsophus pseudomeridianus* was known only from lowland areas of the coasts of Rio de Janeiro and Espírito Santo (Silva et al. 2008; Silveira et al. 2011), and this record is in agreement with this distribution pattern, in the valley of the Muriaé river, a tributary of Paraíba do Sul watershed.

The presence of *Dendropsophus bipunctatus* also represents an important record for the species. According to Carvalho-e-Silva and Verdade (2010) this species occurs in the coastal region of eastern Brazil from Pernambuco to Rio de Janeiro, but according to Izechsohn and Carvalho-e-Silva (2002) *D. bipunctatus* occurs only from Bahia to Rio de Janeiro. In comparison with the distribution map provided by the IUCN, our records considerably extend the occurrence of *D. bipunctatus*.

The presence of species typical of coastal areas and lowlands demonstrates a certain degree of similarity between species composition between coastal and inland forest areas. This reinforces the importance of forests for the preservation of amphibians of the Atlantic Forest in southeastern Brazil.

Conservation of native anurans

During this study we noted some threats to biodiversity in Barão de Monte Alto, with possible direct and indirect impact on the amphibian fauna of the region caused by exploitation activities: removal of native wood from forest areas, cattle using the fields as pasture and removal of native vegetation for subdivisions and monoculture farming. Some of expected consequences of forest removal are reduction of suitable habitats for some species, immersion of forest fragments in non-forest areas, habitat isolation, and increased edge effects (Murcia 1995; Marsh and Pearman 1997). These factors can negatively affect population's persistence of some species in remaining patches (Fahrig 2003; Vieira et al. 2009).

Finally, we emphasise the need to increase the number of studies in the remaining secondary forests of the lowlands of the Atlantic Forest in Brazil, which have continuously become fragmented and deforested (Becker et al. 2007), generating isolated populations which can result in population declines and species extinction (Bradford et al. 1993; Blaustein et al. 1994b; Dupuis 1997; Lips et al. 2005). New occurrence data, improving the understanding of species geographic distributions, population dynamics such as local extinctions and increased abundance of population may be better understood, facilitating the management and conservation of frogs in these fragments.

ACKNOWLEDGEMENTS

We would like to thank everyone who helped us during the fieldwork. We are grateful to José Perez Pombal-Júnior and Manoela Cardoso of Museu Nacional da Universidade Federal do Rio de Janeiro. We thank all residents of Barão de Monte Alto. EAP thanks Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) for financial support and the Instituto Chico Mendes de Conservação da Biodiversidade – ICMBio for collecting license.

LITERATURE CITED

Alvares, C.A., J.L. Stape, P.C. Sentelhas, J.L.M. Gonçalves and G. Sparovek. 2014. Köppen's climate classification map for Brazil. Meteorologische Zeitschrift 22(6): 711–728. doi: 10.1127/0941-2948/2013/0507

Assis, C.L. de, D.J. Santana, F.A. da Silva, F.M. Quintela and R.N. Feio. 2013. A new and possibly critically endangered species of casque-headed tree frog *Aparasphenodon* Miranda-Ribeiro, 1920 (Anura, Hylidae) from southeastern Brazil. Zootaxa 3716(4): 583–591. doi: 10.11646/zootaxa.3716.4.6

Balmford, A., A. Bruner, P. Cooper, R. Costanza, S. Farber, E.R. Green, M. Jenkins, P. Jefferiss, V. Jessamy, J. Madden, K. Munro, N. Myers, S. Naeem, J. Paavola, M. Rayment, S. Rosendo, J. Roughgarden, K. Trumper and R.K. Turner. 2002. Economic reasons for conserving wild nature. Science 297: 950–953. doi: 10.1126/science.1073947

Becker, C.G., C.R. Fonseca, C.F.B. Haddad, R.F. Batista and P.I. Prado. 2007. Habitat split and the global decline of amphibians. Science 318: 1775–1777. doi: 10.1126/science.1149374

Bertoluci, J. 1998. Annual patterns of breeding activity in Atlantic rainforest anurans. Journal of Herpetology 32(4): 607–611. http://www.jstor.org/stable/1565223

Bioacoustics Research Program. 2014. Raven Pro: Interactive Sound Analysis Software (Version 1.5) [Computer software]. Ithaca, NY: The Cornell Lab of Ornithology. Accessed at http://www.birds.cornell.edu/raven, 28 April 2015.

Blaustein, A.R., D.G. Hokit, R.K. O'Hara and R.A. Holt. 1994b. Pathogenic fungus contributes to amphibian losses in the Pacific Northwest. Biological Conservation 67(3): 251–254. doi: 10.1016/0006-3207(94)90616-5

Bokermann, W. C. A. 1968. Three new *Hyla* from the Plateau of Maracás, central Bahia, Brazil. Journal of Herpetology 1: 25–31.

Bradford, F.T. and D.M. Graber. 1993. Isolation of remaining populations of the native frog, Rana muscusa, by introduced fishes in Sequoia and Kings Canyon National Parks, California. Biological Conservation 7(4): 882–888. http://www.jstor.org/stable/2386820

Brooks, T.M.; R.A. Mittermeier, C.G. Mittermeier, G.A.B. Fonseca, A.B. Rylands, W.R Konstant, P. Flick, J. Pilgrim, S. Oldfield, G. Magin and C. Hilton-Taylor. 2002. Habitat loss and extinction in the hotspots of biodiversity. Conservation Biology 16: 909–923. doi: 10.1046/j.1523-1739.2002.00530.x

Caramaschi, U., A.M.P.T. Carvalho-e-Silva, S.P. Carvalho-e-Silva, E. Gouvêa, E. Izecksohn, O.L. Peixoto and J.P. Pombal Jr. 2000. Anfíbios; pp. 75–78, in: H.G. Bergallo, C.F.D. Rocha, M.A.S. Alves and M. Van Sluys (eds.). A Fauna ameaçada de extinção do Estado do Rio de Janeiro. Rio de Janeiro: Editora da Universidade do Estado do Rio de Janeiro (EdUERJ).

Caramaschi, U., R.O.L. Salles and C.A.G. Cruz. 2012. A new species of Stereocyclops Cope (1870) (Anura, Microhylidae) from southeastern Brazil. Zootaxa 3583: 83–88. http://www.mapress.com/zootaxa/2012/f/z03583p088f.pdf

Carvalho-e-Silva, S.P. and V. Verdade. 2010. *Dendropsophus bipunctatus*. The IUCN Red List of threatened species 2010: e.T55411A11303600. Accessed at 10.2305/IUCN.UK.2010-2.RLTS.T55411A11303600.en, 13 October 2015.

Cochran, D.M. 1948. A new subspecies of tree frog from Pernambuco, Brazil. Journal of the Washington Academy of Sciences 38: 316–318.

Cole, E.M., M.R. Bustamante, D. Almeida-Reinoso, W.C. Funk. 2014. Spatial and temporal variation in population dynamics of Andean frogs: effects of forest disturbance and evidence for declines. Global Ecology and Conservation 1: 60–70. doi: 10.1016/j.gecco.2014.06.002

Colwell, R.K. and J.A. Coddington. 1994. Estimating the extent of terrestrial biodiversity through extrapolation. Philosophical Transactions: Biological Sciences 345(1311): 101–118. doi: 10.1098/rstb.1994.0091

Colwell, R.K. 2013: EstimateS: Statistical Estimation of Species Richness and Shared Species from Samples. Version 9.1.0. User's Guide and application. Accessed at http://purl.oclc.org/estimates, 13 October 2015.

Cope, E.D. 1870 ["1869"]. Seventh contribution to the herpetology of tropical America. Proceedings of the American Philosophical Society 11: 147–169.

Cruz, C.A.G., U. Caramaschi and A.G. Dias. 2000. Espécie nova de *Hyla* Laurenti, 1768 do Estado do Rio de Janeiro, Brasil (Amphibia, Anura, Hylidae). Boletim do Museu Nacional. Nova Série, Zoologia 434: 1–8.

Cruz, C.A.G. and R.N. Feio. 2007. Endemismos em anfíbios em áreas de altitude na Mata Atlântica no sudeste do Brasil. Herpetologia no Brasil II. Sociedade Brasileira de Herpetologia; pp. 117–126, in: L.B. Nascimento and M.E. Oliveira (eds.). Herpetologia no Brasil II. Belo Horizonte, Brasil: Sociedade Brasileira de Herpetologia.

Cruz, C.A.G., R.N. Feio and U. Caramaschi. 2009. Anfíbios do Ibitipoca, 1st edition. Belo Horizonte: Bicho do Mato Editora. 132 pp.

Drummond, G.M., C.S. Martins, M.B. Greco and F. Vieira. 2009. Biota Minas: Diagnóstico do Conhecimento sobre a Biodiversidade no Estado de Minas Gerais - Subsídio ao Programa Biota Minas. Belo Horizonte: Fundação Biodiversitas.

Dupuis, L. 1997. Effects of logging on terrestrial-breeding amphibians on Vancouver Island; pp. 185–190, in: D.M. Green (ed.). Amphibians in decline: Canadian studies of a global problem. Herpetological Conservation, number 1. Louis. Missouri: Society for the Study of Amphibians and Reptiles.

Eterovick, P.C., A.C.O.Q. Carnaval, D.M. Borges-Nojosa, D.L. Silvano, M.V. Segalla, I. Sazima. 2005. Amphibian declines in Brazil: an overview. Biotropica 37(2): 166–179. doi: 10.1111/j.1744-7429.2005.00024.x

Fahrig, L. 2003. Effects of habitat fragmentation on biodiversity. Annual Review of Ecology, Evolution, and Systematics 34: 48–515. doi: 10.1146/annurev.ecolsys.34.011802.132419

Faivovich, J., C.F.B. Haddad, D. Baêta, K.H. Jungfer, G.F.R. Álvares, R.A. Brandão, C. Sheil, L.S. Barrientos, C.L. Barrio-Amorós, C.A.G. Cruz and W.C. Wheeler. 2010. The phylogenetic relationships of the charismatic poster frogs, Phyllomedusinae (Anura, Hylidae). Cladistics 26(3): 227–261. doi: 10.1111/j.1096-0031.2009.00287.x

Feio, R.N. and U. Caramaschi. 1995. Aspectos zoogeográficos dos anfíbios do médio rio Jequitinhonha, nordeste de Minas Gerais, Brasil. Revista Ceres 42(239): 53–61. http://www.ceres.ufv.br/ojs/index.php/ceres/article/view/2238/272

Feio, R.N., U.M.L. Braga, H. Wiederhecker and P.S. Santos. 1998. Anfíbios do Parque Estadual do Rio Doce (Minas Gerais). Viçosa: Universidade Federal de Viçosa – Instituto Estadual de Florestas. 32 pp.

Feio, R.N., P.S. Santos and U. Caramaschi. 1999. New records of

Amphibians from Parque Estadual do Rio Doce, State of Minas Gerais, Brazil. Herpetological Review 30(1): 56–57.

Feio, R.N. and U. Caramaschi. 2002. Contribuição ao conhecimento da herpetofauna do nordeste do Estado de Minas Gerais, Brasil. Phyllomedusa 1(2): 105–111. doi: 10.11606/issn.2316-9079.v1i2p105-111

Feio, R.N. and P.L. Ferreira. 2005. Anfíbios de dois fragmentos de Mata Atlântica no Município de Rio Novo, Minas Gerais. Revista Brasileira de Zoociências 7(1): 121–128. https://zoociencias.ufjf.emnuvens.com.br/zoociencias/article/view/179

Feio, R.N., D.L. Silvano, L.B. Nascimento, F.S.F. Leite, P.C. Eterovick, M.R.S. Pires, A.A. Giaretta, C.A.G. Cruz, A.S. Neto and M.V. Segalla. 2008. Anfíbios Ameaçados de Extinção em Minas Gerais; CD-ROM, in: G.M. Drummond, A.B.M. Machado, C.S. Martins and J.R. Stehmann (eds.). Listas Vermelhas das Espécies de Fauna e Flora Ameaçadas de Extinção em Minas Gerais. 2nd ed. Belo Horizonte: Fundação Biodiversitas.

Ficetola, G.F., W. Thuiller and C. Miaud. 2007. Prediction and validation of the global distribution of a problematic alien invasive species — the American Bullfrog. Diversity and Distributions 13(4): 476–485. doi: 10.1111/j.1472-4642.2007.00377.x

Fitzinger, L.J.F.J. 1826. Neue Classification der Reptilien nach ihren Natürlichen Verwandtschaften nebst einer Verwandtschafts-Tafel und einem Verzeichnisse der Reptilien-Sammlung des K. K. Zoologisch Museum's zu Wien. Wien: J.G. Heubner. 66 pp.

Fonseca, G.A.B. 1985. The vanishing Brazilian Atlantic Forest. Biological Conservation 34(1): 17–34. doi: 10.1016/0006-3207(85)90055-2

Fouquet, A., C.S. Cassini, C.F.B. Haddad, N. Pech and M.T. Rodrigues. 2014. Species delimitation, patterns of diversification and historical biogeography of the Neotropical frog genus *Adenomera* (Anura, Leptodactylidae). Journal of Biogeography 41(5): 855–870. doi: 10.1111/jbi.12250

Frost, D.R. 2016. Amphibian Species of the World: an Online Reference. Version 6.0. American Museum of Natural History, New York, USA. Accessed at http://research.amnh.org/herpetology/amphibia/index.html, 18 May 2016.

Gardner, T.A., J. Barlow and C.A. Peres. 2007. Paradox, presumption and pitfalls in conservation biology: the importance of habitat change for amphibians and reptiles. Biological Conservation 138(1–2): 166–179. doi: 10.1016/j.biocon.2007.04.017

Gehara, M., C. Canedo, C.F.B. Haddad and M. Vences. 2013. From widespread to microendemic, molecular and acoustic analyses show that *Ischnocnema guentheri* (Amphibia, Brachycephalidae) is endemic to Rio de Janeiro, Brazil. Conservation Genetics 14(5): 973–982. doi: 10.1007/s10592-013-0488-5

Gehara, M., A.J. Crawford, V.G.D. Orrico, A. Rodríguez, S. Lötters, A. Fouquet, L.S. Barrientos, F. Brusquetti, I. De la Riva, R. Ernst, G.G. Urrutia, F. Glaw, J.M. Guayasamin, M. Hölting, M. Jansen, P.J. Kok, A. Kwet, R. Lingnau, M. Lyra, J. Moravec, J.P. Pombal-Jr, F.J. Rojas-Runjaic, A. Schulze, J.C. Señaris, M. Solé, M.T. Rodrigues, E. Twomey, C.F. Haddad, M. Vences and J. Köhler. 2014. High Levels of Diversity Uncovered in a Widespread Nominal Taxon: Continental Phylogeography of the Neotropical Tree Frog *Dendropsophus minutus*. PLoS ONE 9(9): e103958. doi: 10.1371/journal.pone.0103958

Gerhardt, H.C., C.C. Martínez-Rivera, J.J. Schwartz, V.T. Marshall and C.G. Murphy. 2007. Preferences based on spectral diferences in acoustic signals in four species of treefrogs (Anura: Hylidae). The Journal of Experimental Biology 210: 2990–2998. doi: 10.1242/jeb.006312

Glaw, F. and M. Frazen. 2006. Type catalogue of amphibians in the Zoologische Staatssammlung München. Spixiana 29(2): 153–192. http://www.biodiversitylibrary.org/page/28195131

Gotelli, N.J and R.K. Colwell. 2001. Quantifying biodiversity: procedures and pitfalls in the measurement and comparison of species richness. Ecology Letters 4(4): 379–391. doi: 10.1046/j.1461-0248.2001.00230.x

Haddad, C.F.B., L.F. Toledo, C.P.A. Prado, D. Loebmann, J.L. Gasparini and I. Sazima. 2013. Guia dos anfíbios da Mata Atlântica — diversidade e biologia. São Paulo: Anolis Books. 542 pp.

Heyer, W.R. 1983. Clarification of the names *Rana mystacea* Spix 1824, *Leptodactylus amazonicus* Heyer 1978, and a description of a new species, *Leptodactylus spixi* (Amphibia: Leptodactylidae). Proceedings of the Biological Society of Washington 96: 270–272.

Heyer, W.R., M.A. Donnelly, R.W. Mcdiarmid, L.A. Hayek and M.S. Foster. 1994. Measuring and monitoring biological diversity — standard methods for amphibians. Washington and London: Smithsonian Institution Press. 364 pp. http://www.biodiversitylibrary.org/page/29941249

Hoogmoed, M.S. and U. Gruber. 1983. Spix and Wagler type specimens of reptiles and amphibians in the Natural History Musea in Munich (Germany) and Leiden (The Netherlands). Spixiana. Munique 9: 319–415.

IBGE (Instituto Brasileiro de Geografia e Estatística). 2016. Accessed at http://www.ibge.gov.br/, 21 April 2016.

IUCN (International Union for Conservation of Nature). 2015. The IUCN Red List of threatened species. Version 2015.1. Accessed at http://www.iucnredlist.org, 1 June 2015.

Izechsohn, E. and S.P. Carvalho-e-Silva. 2002. Anfíbios do Município do Rio de Janeiro. Rio de Janeiro: Editora UFRJ.

Kats, L.B. and R.P. Ferrer. 2003. Alien predators and amphibian declines: review of two decades of science and the transition to conservation. Diversity and Distributions 9(2): 99–110. doi: 10.1046/j.1472-4642.2003.00013.x

Kiesecker, J.M. 2003. Invasive species as a global problem: toward understanding the worldwide decline of amphibians; p. 324, in: R.D. Semlitsch (ed.). Amphibian conservation. Washington, D.C.: Smithsonian Books.

Köppen, W. 1948. Climatologia: con un estudio de los climas de la tierra. México: Fondo de Cultura Econômica. 479 pp.

Lawler, J.J., J.E. Aukema, J.B. Grant, B.S. Halpern, P. Kareiva, C.R. Nelson, K. Ohleth, J.D. Olden, M.A. Schlaepfer, B.R. Silliman and P. Zaradic. 2006. Conservation science: a 20-year report card. Frontiers in Ecology and the Environment 4(9): 473–480. doi: 10.1890/1540-9295(2006)4[473:CSAYRC]2.0.CO;2

Lips, L.R., P.A. Burrowes, J.R. Mendelson III, G. Parra-Olea. 2005. Amphibian declines in latin america: widespread population declines, extinctions, and impacts. Biotropica 37(2): 163–165. http://www.jstor.org/stable/30043168

Lowe, S., M. Browne, S. Boudjelas and M. de Poorter. 2000. 100 of the world's worst invasive alien species a selection from the global invasive species database. New Zeland: The Invasive Species Specialist Group. 12 pp.

Lutz, A. 1925. Batraciens du Brésil. Comptes Rendus et Mémoires Hebdomadaires des Séances de la Société de Biologie et des ses Filiales. Paris 93(2): 211–214.

Marsh, D.M. and P.B. Pearman. 1997. Effects of habitat fragmentation on the abundance of two species of Leptodactylidae frogs in the Andean montane forest. Conservation Biology 11(6): 1323–1328. doi: 10.1046/j.1523-1739.1997.95519.x

MMA (Ministério do Meio Ambiente). 2014. Portaria nº 444, de 17 de dezembro de 2014. Lista Nacional das Espécies da Fauna Brasileira Ameaçadas de Extinção. http://www.icmbio.gov.br/ortal/images/stories/biodiversidade/fauna-brasileira/avaliacao-do-risco/PORTARIA_N%C2%BA_444_DE_17_DE_DEZEMBRO_DE_2014.pdf

Mertens, R. 1926. Herpetologischen Mitteilungen VIII–XV. Senckenbergiana Biologica 8: 137–15

Metzger, J.P., MC. Ribeiro, G. Ciocheti and L.R. Tambosi. 2008. Uso de índices de paisagem para a definição de ações de conservação e restauração da biodiversidade do Estado de São Paulo; pp. 120–

127, in: R.R. Rodrigues, C.A. Joly, M.C.W. de Brito, A. Paese, J.P. Metzger, L. Casatti, M.A. Nalon, N. Menezes, N.M. Ivanauskas, V. Bolzani and V.L.R. Bononi (eds.). Diretrizes para Conservação e Restauração da Biodiversidade no Estado de São Paulo. São Paulo: Secretaria do Meio Ambiente and Fapesp.

Mittermeier, R.A., P. Robles Gil, M. Hoffmann, J. Pilgrim, T. Brooks, C.G. Mittermeier, J. Lamoreux and G.A.B. da Fonseca. 2004. Hotspots revisited: Earth's biologically richest and most endangered terrestrial ecoregions. Mexico City: CEMEX/ Agrupacion Sierra Madre. 392 pp.

Moura, M.R., A.P. Motta, V.D. Fernandes and R.N. Feio. 2012. Herpetofauna da Serra do Brigadeiro, um remanescente de Mata Atlântica em Minas Gerais, Sudeste do Brasil. Biota Neotropica. 12(1): 209–235. doi: 10.1590/S1676-06032012000100017

Murcia, C. 1995. Edge effects in fragmented forests: implications for conservation. Trends in Ecology 10(2): 58–62. doi: 10.1016/S0169-5347(00)88977-6

Myers, N., R.A. Mittermeier, C.G. Mittermeier, G.A.B. da Fonseca and J. Kent. 2000. Biodiversity hotspots for conservation priorities. Nature 403: 853–858. doi: 10.1038/35002501

Nascimento, L.B., M. Wachlevski and F. Leite. 2005. Anuros; pp. 209–230, in: A.C. Silva, L.C.V.F. Pedreira and P.A.A. Abreu (eds.). Serra do espinhaço Meridional: Paisagens e ambientes. Belo Horizonte: O Lutador.

Nascimento, L.B., F.S.F. Leite, P.C. Eterovick and R.N. Feio. 2009. Anfíbios; pp. 221–248, in: G.M. Drummond, C.S. Martins, M.B. Greco and F. Vieira (orgs.). Biota Minas: Diagnóstico do Conhecimento sobre a Biodiversidade no Estado de Minas Gerais — Subsídio ao Programa Biota Minas. Belo Horizonte: Fundação Biodiversitas.

Pearl, C.A., M.J. Adams, R.B. Bury and B. Mc Creary. 2004. Asymmetrical effects of introduced bullfrogs (*Rana catesbeiana*) on native ranid frogs in Oregon. Copeia 2004(1): 11–20. http://www.jstor.org/stable/1448632

Ribon, R., J.E. Simon and G.T. Mattos. 2003. Bird extinctions in Atlantic Forest fragments of the Viçosa Region, southeastern Brazil. Conservation Biology 17(6): 1827–1839. doi: 10.1111/j.1523-1739.2003.00377.x

Santana, D.J., V.A. São Pedro, P.S. Hote, H.M. Roberti, A.C. Sant'Anna, C.A. Figueiredo-de-Andrade and R.N. Feio. 2010. Anurans in the Region of the High Muriaé River, state of Minas Gerais, Brazil. Herpetology Notes 3: 1–10. http://www.herpetologynotes.seh-herpetology.org/Volume3_PDFs/Santana_et_al_Herpetology_Notes_Volume3_pages001-010.pdf

Santos, A.J. 2004. Estimativas de riqueza em espécies; pp. 19–41, in: L. Cullen Jr., R. Rudran and C. Valladares-Pádua (orgs.). Métodos de estudos em biologia da conservação e manejo da vida silvestre. Curitiba: Universidade Federal do Paraná (UFPR).

Segalla, M.V., U. Caramaschi, C.A.G. Cruz, P.C.A. Garcia, T. Grant, C.F.B. Haddad and J. Langone. 2014. Brazilian amphibians — list of species. Accessed at **http://www.sbherpetologia.org.br**, 3 February 2015.

Shaw, G. 1802. General zoology or systematic natural history. Volume 3(1) Amphibia. London: Thomas Davison. 312 pp. doi: 10.5962/bhl.title.1593

Silva, G.R.., S.P. Carvalho-e-Silva and A.M.P.T. Carvalho-e-Silva. 2008. Amphibia, Anura, Hylidae, *Dendropsophus pseudomeridianus*: distribution extension and geographic distribution map. Check List 4(1): 15–17. doi: 10.15560/4.1.15

Silvano, D.L. and M.V. Segalla. 2005. Conservação de anfíbios no Brasil. Megadiversidade 1(1): 79–86.

Silveira, A.L., R.C. Fontes and R.O.L. Salles. 2011. Novos registros geográficos e variação na coloração de *Dendropsophus pseudomeridianus* (Amphibia, Anura, Hylidae) no Estado do Rio de Janeiro, Brasil. Biotemas 24(3): 145–151. doi: 10.5007/2175-7925.2011v24n3p145

SOS Mata Atlântica e Instituto Nacional de Pesquisas Espaciais - INPE. 1997. Atlas dos remanescentes florestais do Domínio Mata Atlântica. São José dos Campos, São Paulo: Fundação SOS Mata Atlântica e INPE.

SpeciesLink. 2015. SpeciesLink: Sistema de Informação Distribuído para Coleções Biológicas. Accessed at http://splink.org.br, 11 November 2014.

Spix, J.B.V. 1824. Animalia nova sive Species novae Testudinum et Ranarum quas in itinere per Brasiliam annis MDCCCXVII–MDCCCXX jussu et auspiciis Maximiliani Josephi I. Bavariae Regis. München: F. S. Hübschmann. doi: 10.5962/bhl.title.3665

Steffen, G.A. 1815. De Ranis nonnullis Observationes Anatomicae quas Consensu Gratiosae Facultatis Medicae. Berlin: Joannis Friderici Starckii.

Thome, M.T.C., K.R. Zamúdio, C.F.B. Haddad and J. Alexandrino. 2012. Delimiting genetic units in Neotropical toads under incomplete lineage sorting and hybridization. BMC Evolutionary Biology 12: 242. doi: 10.1186/1471-2148-12-242

Vanzolini, P.E. 1981. The scientific and political contexts of the Bavarian Expedition to Brazil. Introduction; pp. ix–xxix, in: K. Adler (ed.). Herpetology of Brazil, by von Spix, J.B. and Wagler, J.C. facsimilar reprint. Oxford, Ohio: Society for the Study of Amphibians and Reptiles.

Vieira, M.V., N. Olifiers, A.C. Delciellos, V.Z. Antunes, L.R. Bernardo, C.E.V. Grelle and R. Cerqueira. 2009. Land use vs. Fragmente size and isolation as determinants of small mammal composition and richness in Atlantic Forest remnants. Biological Conservation 142(6): 1191–1200. doi: 10.1016/j.biocon.2009.02.006

Vitouseck, P.M., C.M. D'Antonio, L.L. Loope, M. Rejmanek and R. Westbrooks. 1997. Introduced species: a significant component of human-caused global change. New Zealand Journal of Ecology 21: 1–16. http://newzealandecology.org/system/files/articles/NZJEcol21_1_1.pdf

Werner, E.E., G.A. Wellborn and M.A. Mcpeek. 1995. Diet composition in post metamorfic bullfrogs and green frogs: implications for interspecific predation and competition. Journal of Herpetology 29(4): 600–607. http://www.jstor.org/stable/1564744

Wied-Neuwied, M.A.P., Prinz zu. 1821. Reise nach Brasilien in den Jahren 1815 bis 1817. Volume 2. Franfurt am Main: Henrich Ludwig Brönner.

Wied-Neuwied, M.A.P., Prinz zu. 1824. Verzeichnis der Amphibien welche in zweiten Bande der Naturgeschichte Brasiliens von Prinz Max von Neuwied werden beschreiben Werden. Isis von Oken 14: 661–673.

Wogel, H. 2005. Comportamento social de *Dendropsophus bipunctatus* (Amphibia, Anura, Hylidae): organização do coro, seleção sexual e vocalização [PhD thesis]. Rio de Janeiro: Museu Nacional, Universidade Federal do Rio de Janeiro, Programa de Pós-Graduação em Ciências Biológicas (Zoologia). 120 pp.

Author contributions: EAP, MON, PSH collected the data; EAP wrote the text; EAP and DJS identified the specimens; DJS made the analysis; RNF and DJS revised the text.

Received: 19 November 2015
Accepted: 19 August 2016
Academic editor: Ross MacCulloch

APPENDIX

Specimens of anurans collected at the municipality of Barão de Monte Alto, State of Minas Gerais, Brazil.

Adenomera marmorata – MZUFV: 15780, *Dendropsophus bipunctatus* – (MZUFV: 4479 – 83, 5483 – 87, 7199, 13427 – 28, 14820 – 28, 14918 – 20, 15496 – 02, 15787), (MNRJ: 15496 – 502, 37238, 43645

– 46, 56957 – 58, 78210), (LZV 662A – 63A), (MCNAN: 4848 – 55); *Dendropsophus branneri* – MZUFV: 13917 – 22, 14800 – 02, 14950, 15789, 15808, 15809; *Dendropsophus decipiens* – MZUFV: 14817 – 19, 15791; *Dendropsophus elegans* – MZUFV: 13908 – 10, 14807, 14906, 14925; *Dendropsophus minutus* – MZUFV: 13926, 13927, 13930, 13931, 13933, 14803, 14804, 14836; *Dendropsophus pseudomeridianus* – (MZUFV: 14931 – 35, 15788, 15790), (ZUFRJ: 6757, 6759, 7128, 11063), (MNRJ: 52417 – 18, 52425, 52458 – 61, 52465 – 68, 52557 – 60, 52570 – 77); *Elachistocleis cesarii* – MZUFV: 14922; *Haddadus binotatus* – MZUFV: 14816, 15034, 15035, 15782, 15783, 15803, 15804; *Hypsiboas albomarginatus* – MZUFV: 14838 – 40, 14945, 15784; *Hypsiboas albopunctatus* – MZUFV: 13905 – 07, 14797, 14836, 14837, 14951, 14952; *Hypsiboas faber* – MZUFV: 13894, 14928; *Hypsiboas pardalis* – MZUFV: 13902 – 04, 14946, 15806, 15807; *Hypsiboas polytaenius* – MZUFV: 14949, 15802; *Hypsiboas semilineatus* – MZUFV: 13896, 13897, 14798, 14799, 14813, 14910 – 15, 14944, 15785, 15786; *Ischnocnema sp.* – MZUFV: 15781; *Leptodactylus fuscus* – MZUFV: 13911 – 16, 14908, 14921; *Leptodactylus latrans* – MZUFV: 13934 – 42, 14909, 14937 – 43; *Leptodactylus spixi* – MZUFV: 14841 – 46, 15043; *Lithobates catesbeianus* – MZUFV: 15987 ; *Phyllomedusa rohdei* – MZUFV: 13898 – 901, 14810, 14927; *Physalaemus cuvieri* – MZUFV: 13889 – 91, 13923, 14847 – 49, 14923, 14924, 14926, 14929, 14947; *Proceratophrys boiei* – MZUFV: 15031, 15765 – 69, 15801; *Rhinella ornata* – MZUFV: 13895, 14816, 14829, 14830, 14917, 15032, 15033, 15800; *Scinax crospedospilus* – MZUFV: 14805, 14806, 14808, 14809, 15037, 15038, 15805; *Scinax eurydice* – MZUFV: 14953, 14954; *Scinax fuscovarius* – MZUFV: 13892, 14905, 15036; *Thoropa miliaris* – MZUFV: 13893, 14831 – 35, 14907, 14948, 15030, 15770 – 79, 15797 – 99.